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ATTACHMENT A

Affidavit of John M. Celentano

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Owings Mills, Maryland

On behalf of

Telegate Inc.

March 2000

PRESUBSCRIBED 411: A Technical and Cost Analysis

Introduction

1. My name is John M. Celentano. I am President of Skyline Marketing Group, Ltd. Skyline Marketing Group is an Owings Mills, Maryland-based marketing consulting firm specializing in telecommunications and information technology. Our focus is public network infrastructure. In this area of specialization, we provide market research, strategy consulting and investment advice. Our client base includes telecom and IT equipment manufacturers, service providers, and selected financial and investment firms. Since 1980, we have advised the leading telecom and IT equipment manufacturers, and telecommunications service providers worldwide.

2. My principal area of specialization is analyzing demand for, and determining strategic positioning of, advanced telecommunications and IT technologies in public network applications in ways that equipment manufacturers and their carrier customers can deliver value to business and residential subscribers. I have nearly 29 years experience in the telecommunications industry. My background is a unique blend of telephone operating company, and equipment manufacturing environments in a variety of engineering, marketing, sales and management positions. As a consultant for almost 20 years, I have helped equipment manufacturers and service providers alike define applications and leverage their telecommunications and IT technology to their customers' benefit. I have specific knowledge and expertise in the directory assistance (DA) market, having researched the market and subsequently publishing our findings and conclusions in trade magazines.[1] I have also advised companies in the DA business on the development of their business plans. My biography is shown as Appendix I.

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[1] Celentano, John M., *Nationwide Directory Assistance: A Sound Choice in the Competitive Cacophony,* X-Change magazine, December 15, 1998.

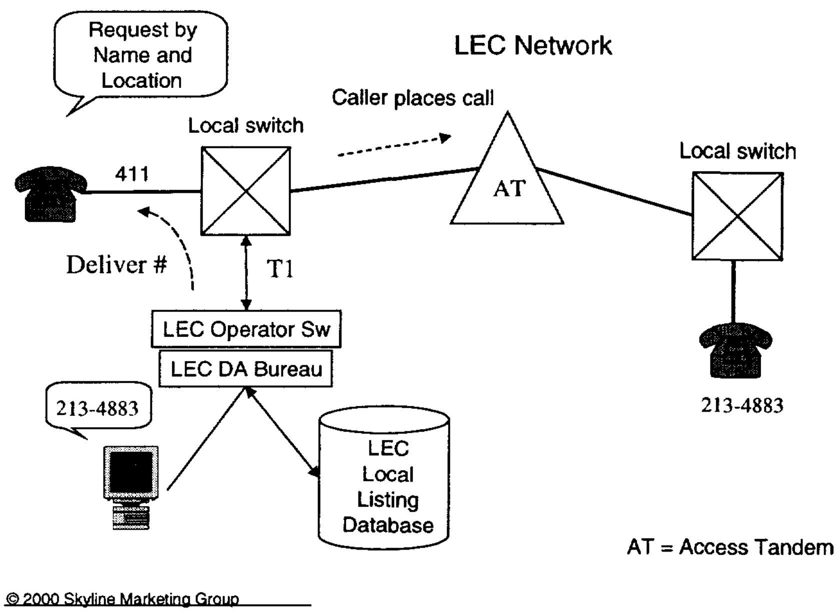
3. The proposal for presubscribed 411 service being presented by Telegate is consistent with current network technology. Telegate's plan takes advantage of available advanced intelligent network (AIN) technology while fostering competition among directory assistance (DA) service providers at the local level. In this Affidavit, I will analyze the technical feasibility of Telegate's proposal. These topics I will discuss:

   - Current functioning of local and non-local DA;
   - Technical alternatives for presubscription of DA; and,
   - Implementation of an AIN solution for presubscribed 411.

How Local DA Works Today

4. When a caller dials 411, the call is routed automatically from the caller's local switch over a dedicated trunk to an Operator Switch supporting the DA service bureau that the ILEC maintains. For callers that have switched to a competitive local exchange carriers (CLEC), CLECs may route their customers' 411 calls to the ILEC DA bureau, to the CLEC's own DA bureau, or to a CLEC-designated outsourced DA service provider. The process is highly automated with a front-end interactive voice response (IVR) used to obtain the desired name and city information from the caller. To find a local number, the DA operator keys the desired name into the ILEC's local listing database. The DA operator selects the number presented by the system, and delivers it automatically to the caller via IVR, or orally if further operator assistance is needed. Depending on the jurisdiction, callers may be allowed a number of free DA requests each month before being charged for each call. Our own survey[2] of state PUC filings determined that local DA charges average 40¢ among the ILECs.

Exhibit 1 Local DA



5. The default carrier for local directory assistance (DA) remains with the serving, or incumbent local exchange carrier (ILEC). In some cases, independent telephone companies (ITCos) that have contiguous territory with a Regional Bell Operating Company (RBOC) will provide their listings to the RBOC, and route 411 calls from their customers to the RBOC DA service bureau for handling on a contractual basis. A number of CLECs have opted for the same arrangement because they do not have sufficient volume to warrant their own DA services. So they are forced to rebrand ILEC DA services, or contract with a third-party outsourcer that offers DA services under the CLECs' names. In either case, offering DA costs more for the CLECs than it does the ILEC. Consequently, CLECs are at a competitive disadvantage. CLECs currently serve about 7% of total access lines[3]. So, the RBOCs for all intents and purposes still control access to the customer, and 411 access to DA services.

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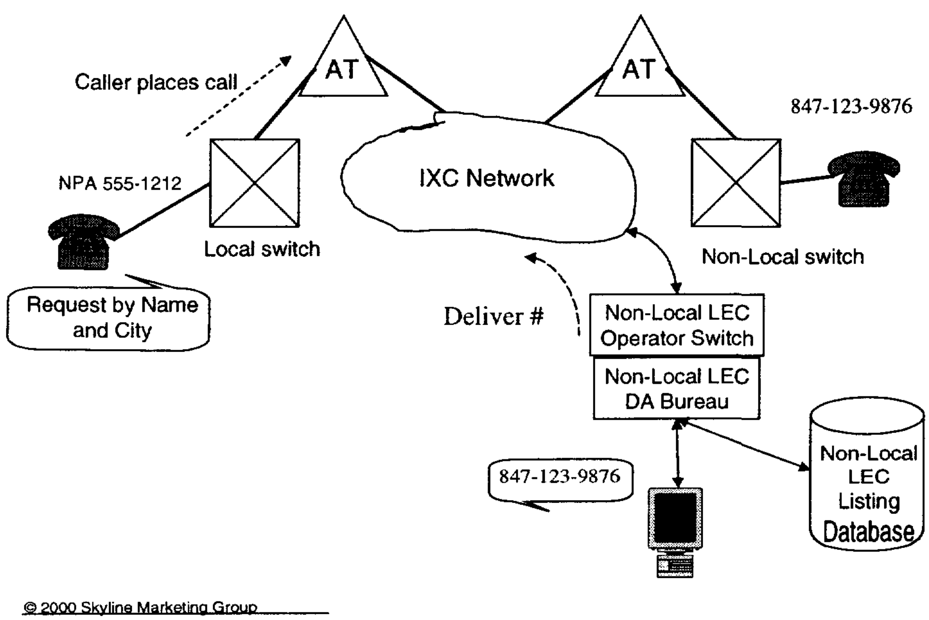
[2] *Local DA Tariffs Survey*, Skyline Marketing Group, Owings Mills, MD, 1997.
[3] *1999 Annual Report on Local Telecommunications Competition*, New Paradigm Resources Group, Chicago, IL, March 1999.

How Nationwide DA (NDA) Works Today

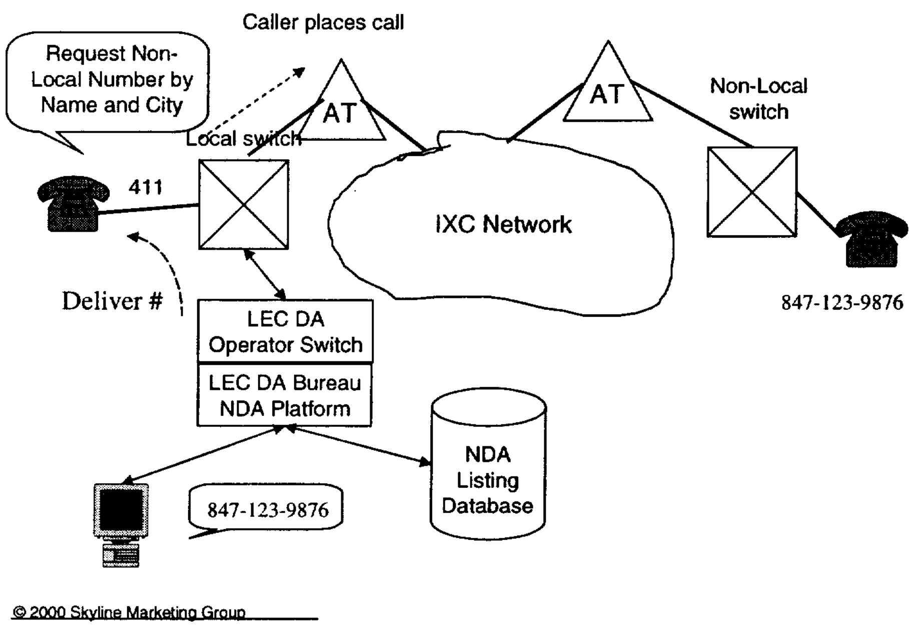
6. Traditionally, when a caller sought a "non-local" listing, the common procedure was to dial 1-NPA-555-1212, where NPA is the area code of the distant region. Under this arrangement, the ILEC serving that distant area code provided terminating DA services. That is, the call would be routed to the DA bureau of the terminating ILEC, the DA operator would retrieve the number, and orally or mechanically pass it on to the caller. Three carriers are involved in handling the DA request: the originating LEC, an IXC and the terminating LEC. Each receives a portion of the charge that averages 95¢ per call. This is essentially remote local DA via long distance. The caller would then have to place a second call to reach the called party. It should be noted that some IXCs have been handling non-local DA themselves for a long time. For instance, when AT&T customers dial NPA 555-1212, their requests are routed to an AT&T DA center for fulfillment.

Exhibit 2 Traditional Non-Local DA



7. Increasingly, ILEC customers now can obtain both local and nationwide DA listings simply by dialing 411. For non-local (also referred to as out-of-region) listings, DA operators search an NDA database for the requested numbers, and deliver them to callers just as they do for local DA listings. At that point, callers are given the option of having the call completed automatically for an additional charge, or dialing the call themselves. The NDA database consists of local databases of all of the major ILECs compiled by a third-party database company. It should be noted that interexchange carriers (IXCs) such as AT&T and MCI WorldCom also offer NDA but only the ILECs can offer NDA via 411. So, the IXCs are forced to market dial around programs (such as AT&T's '00' INFO and MCI WorldCom's 10-10-9000) to provide their customers with a similar service. Such programs incur high marketing costs and have limited success. Furthermore, as the ILECs become eligible to enter the long distance market, they will now have access to both their own local and NDA databases. Retaining control of 411 gives them a competitive advantage over other DA providers.

Exhibit 3 ILEC NDA



411 Presubscription: Alternate Implementation Methods

8. There are two distinct ways to facilitate directory assistance pre-subscription via 411:

<u>Option 1.</u> Utilize the Advanced Intelligent Network (AIN) to make DA provider selection and routing independent of the switching systems.

<u>Option 2.</u> Create new call processing and translation software for each central office switch to facilitate a distinct routing for each DA provider.

We have reviewed both approaches. We conclude that Option 2 would be costly and difficult to implement. By contrast, Option 1 can be implemented using software that is already very widely deployed, and for little additional cost.

Option 1 AIN Is An Attractive Solution

9. We believe that an AIN solution is a simple, elegant and cost-effective approach. With AIN, the LECs readily can utilize a facility that already serves over 90% of the U.S. market. AIN gives consumers the ability to presubscribe to DA providers as easily as selecting their long distance providers. More important, AIN is already operational for other services such as caller ID with name (CNAM), local number portability (LNP), and toll free (800/888/877) calls. Extending AIN capabilities to presubscribed DA involves incremental investment at most.

10. AIN was originally conceived and promoted by the LECs as a way to become less dependent on their switching system vendors for new service developments. Moreover, AIN is a 'switch-independent' solution that is designed to eliminate the need for complex, costly switch upgrades such as the solution proposed in Option 2.

Option 2 Central Office Switch Programming

11. Under Option 2, each Class 5 central office switch would need to be programmed to recognize that when a caller dials 411, a connection must be set up to that caller's pre-selected DA provider, whether that is the ILEC DA bureau, an IXC call center, or a third-party DA provider. This connection would be facilitated through new call processing and translation software that would be required in each switch to recognize the unique routing requirements when 411 is dialed on any given line.

12. In order to evaluate the merits of Option 2, we first approached both Nortel Networks and Lucent Technologies, as the leading central office switching system manufacturers in the United States. Both companies pointed out that with current software releases in their respective DMS-100 and 5ESS Class 5 switching systems, call processing and translations cannot support an alternative 411 DA service provider on a presubscription basis. Implementing this capability would require a relatively

large and complex feature development to update call processing and line service ordering.

13. Through information requests by e-mail and telephone to both Nortel and Lucent, we determined that each company would be willing to undertake such a software development for their local exchange carrier customers if requested. The vendors indicated, however, that developing and testing the necessary software code would require a dedicated team of six to eight software designers and testers. The typical delivery cycle for switching system-based software from planning, development, testing, and manufacturing is eighteen months. On this basis, we estimate that software development costs alone would amount to approximately $2 million dollars.[4] Both companies indicated that they would provide a firm price quotation for the development if requested by their customers.

14. Once fully tested and manufactured, both companies would make this software available to their customers as an update to the switching systems software that is already loaded into their central office switches. Switching software usually is sold on a right-to-use (RTU) fee basis. Actual prices are negotiated between the switch suppliers and their customers.

15. It is important to note that this software development alternative is "switch dependent." This means that all the manufacturers that have their switching systems operating in the United States today including, leading suppliers such as Nortel, Lucent, Siemens, and Ericsson along with several smaller switch vendors, must undertake parallel custom developments for their own systems. So the development process is replicated and the associated costs are compounded. We estimate that the

[4] Neither Nortel nor Lucent provided dollar estimates for the CO switching system software development. We estimated these costs based on industry levels for software engineers of about $150,000 per man-year, including compensation and benefits.

total cost to develop a switch-dependent solution could amount to tens of millions of dollars. Moreover, RTU fees on an installed base of over 9,000 local switches[5] nationwide will amount to a substantial investment by the local exchange carriers.

AIN Overview

16. AIN was originally conceived and promoted by Bell Communications Research (Bellcore), now Telcordia Technologies, as the technical authority for the RBOCs. AIN is an advanced architecture for the telephone network. AIN's foundations are based on the evolution of computer-based switching systems and Signaling System No. 7 (SS7) protocol. An Intelligent Network Primer is contained in Appendix III and is shown in Exhibit 4.

17. AIN's purpose is to implement a network that can offer advanced services without rewriting the software on, or re-engineering the hardware of, the central office switch. AIN has been adopted by virtually every U.S. telephone company as its current and future network architecture. In addition, AIN features are deployed throughout the network today.

18. AIN is significant for two main reasons. First, AIN allows the network to change the routing of calls within the network from moment to moment based on specified criteria beyond simply finding a path through the network for the call. Second, the originating or receiving carrier of the call can send intelligence into the network that can affect the flow of the call (whether inbound or outbound).

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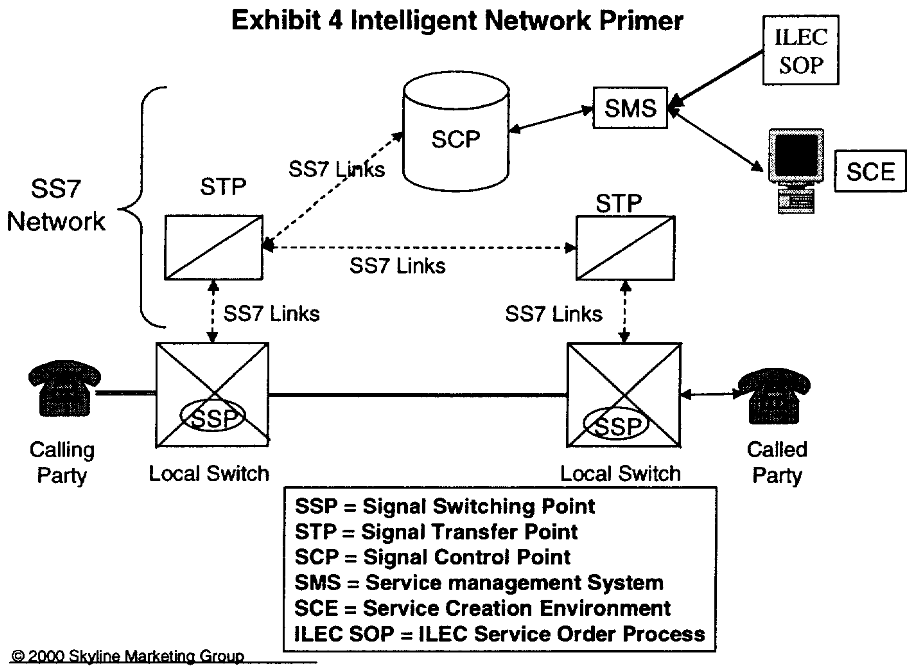
[5] FCC ARMIS Database.

19. The AIN concept is simple. Call Processing in switches involves multiple serial actions. AIN adds trigger detection points (TDPs) between the actions, which if set, cause the switch to suspend call processing, and look externally for instructions on how to process the call. The switch queries a database to ascertain, "What should I do with this call at this moment?" The response then determines how the call is handled by the switch. The database may be owned by the LEC, an IXC, external service provider, or an end user. Examples of common AIN functions in service today include 800/888/877 database services, local number portability (LNP), and caller ID with name delivery (CNAM).

20. AIN comprises three key network elements:

- Service Control Points (SCPs) are computers that hold real-time databases containing subscriber-specific information used by the network to route calls for specific services.
- Signal Switching Points (SSPs) are that part of Class 5 digital switching systems that communicate with SCPs and request subscriber-specific instructions as to how the call should be completed.
- Signal Transfer Points (STPs) are packet data switches that shuttle messages back and forth between SSPs and the appropriate SCPs.



21. All three elements communicate through out-of-band signaling using SS7 protocol. Here is how the AIN uses these elements: A subscriber first dials a set of digits (referred to here as "digits dialed") that make up the number of the party the caller wishes to reach. The SSP identifies the particular digits-dialed as requiring intelligent network processing.[6] The SSP suspends the call at the local switch, and launches a "query" to find out how this call should be handled. This query is passed via SS7 signaling through STPs to the proper SCP for this service. That SCP then interprets the query based on the criteria in its database and information (such as the originating telephone number) provided by the SSP. Once the SCP determines how the call is to be handled, it issues a "response" via SS7 signaling through STPs back to the SSP. This response is a message that instructs the SSP how the call should be handled in the network. The SSP passes these instructions to the switch and the call processing resumes. Note that this "query and response" activity takes place within about half a second after the caller dials the last digit of the number. Usually the caller is unaware

[6] FCC ARMIS Database indicates that 99-100% of local switches and tandems among the RBOCs and over 85% among the independent telcos are equipped for SS7 service.

that this is even taking place. The next thing the caller may hear is ringing, a busy signal, or a recording instructing him to take further action.

22. Two other elements are an important part of the AIN architecture:

- Service Management System (SMS) is a database management system that allows the provisioning and updating of SCP database information concerning subscribers and services. These data are required for billing and administrative purposes. Using the service order process (SOP) that provides current subscriber data including data concerning carrier or DA provider selection, carriers that operate SCPs, or third-party administrators such as NeuStar for local number portability, can implement changes to the SCP from the SMS on a daily basis.
- Service Creation Environment (SCE) allows outside software developers (that is, outside of the switching system manufacturers' control) to define and create new value-added services by connecting pre-existing blocks of software code into a flow chart that describes the logical processes the service will use to handle calls. The SCE is a computer that comprises a toolkit for the creation of services that can be provided on a network basis. With the SCE, a carrier can develop a generic service for its subscribers. Similarly, a third-party software developer or end user can develop such a service application. Once a service application is created, that capability is transferred from the SCE to the SMS. From the SMS, a command can be initiated to download the new service logic into all the SCPs that the SMS oversees.

AIN Deployment in the United States

23. AIN Release 0.1 (or simply, AIN 0.1) is currently in operation in the U.S. network. AIN 0.1 is the first operational phase of intelligent networking. Its requirements are defined in Bellcore specifications TR1284 and TR1285, published in 1995. These specifications identified the fundamentals of AIN and defined the interaction of the Class 5 digital switching systems with the SCPs. AIN 0.1 is widely deployed because, among other things, it is the basis on which Local Number Portability (LNP) operates.

24. In the First Memorandum Opinion and Order on Reconsideration (FCC 97-74) on the rules governing the deployment of telephone number portability, the Commission established a timetable that LNP was to be operational in the top 100 metropolitan statistical areas (MSAs) in the United States by May 15, 1998. All the carriers and their switching system vendors responded accordingly. Nortel estimates that approximately 95% of the DMS switches in service are equipped with AIN 0.1. Lucent indicated a similar level of penetration with their 5ESS system installed base. We believe that switch manufacturers such as Siemens, Ericsson, and others also have their systems similarly equipped. We estimate that AIN 0.1 is operational in Class 5 local switches that serve well over 90% of the total access lines in the country today.[7]

Use of N11 Triggers

25. AIN 0.1 also includes a capability referred to as N11 Triggers. A trigger is a software-defined "hook" that is specific to the associated service. When a trigger is detected, the call processing is suspended while more information related to the delivery of that particular service is collected. There are three trigger types: subscribed or line-based, group-based, or office-based. Subscribed triggers are provisioned to the customer's line so that any calls originating from or terminating to that line would encounter the trigger. Group-based triggers are assigned to groups of subscribers (e.g., business or Centrex groups). Any member of the software-defined group will encounter the trigger. Office-based triggers are available to everyone who

[7] *Project ESS*, Dittberner Associates, Bethesda, MD, August 1999.

is connected to the telephone switching office or has access to the North American Numbering Plan. Office-based triggers are not assigned to individuals or groups.

26. N11 triggers are not being used today even though that capability resides in local switches equipped with AIN 0.1. Rather, when a subscriber dials a 3-digit Service Code, the switch routes the call to a dedicated trunk that connects the caller directly to a designated call center or bureau that handles such requests.

27. It should be noted that under the FCC's N11 Order, the Commission reinforced the notion that N11 codes are special purpose numbers, and it declined to "disturb the current allocation of various N11 codes for access to emergency services, directory assistance, and LEC repair and business offices."[8] Furthermore, the Commission concluded that "a LEC may not itself offer enhanced services using a 411 code, or any other N11 code, unless that LEC offers access to the code on a reasonable, nondiscriminatory basis to competing enhanced service providers in the local service area for which it is using the code to facilitate distribution of their enhanced services."[9]

Consistency with N11 Order

28. The N11 trigger feature makes it possible for ILECs to make 411 available to other providers on a non-discriminatory basis. Enabling this AIN feature which is already loaded in local switches, when a caller dials a 3-digit Service Code, the SSP will launch a query to an SCP to determine how to route the call. The routing is no longer dedicated. Rather, the N11 call can be routed to an alternate or competing service provider that is preselected by the subscriber. This means that N11 codes can be shared on a non-discriminatory basis, and used by multiple service providers in the

[8] Use of N11 Codes and Other Abbreviated Dialmaking Arrangements, CC Dkt. No. 92-105, First Report & Order and Further Notice of Rulemaking, 12 FCC Rcd 5572 at 5575 (1997) (*N11 Order*).

[9] *Id.*

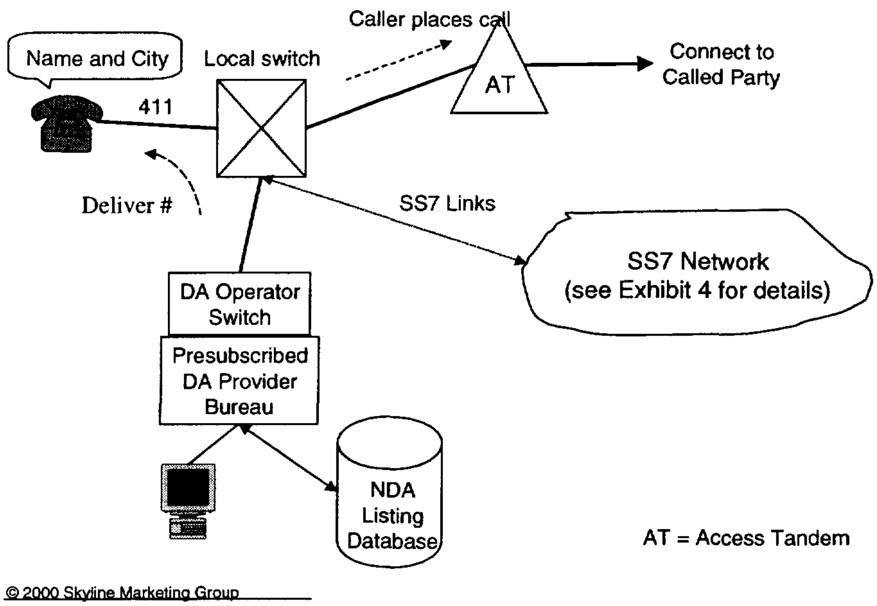
same local service area. This approach is consistent with the N11 Order. Each N11 trigger can be individually set On/Off separately for any 3-digit Service Code. This setting can be done either on an individual line basis, or for the whole switch (which is what we are proposing).

Presubscribed 411 Implementation Proposal

How It Works

29. From an SS7 perspective, no new protocols or services will be required for implementation. It should be noted that there are many similarities with this proposed solution to LNP. The similarities include: a requirement for an SS7 query and response on every 411 call, a new Service Control Point (SCP) database and call processing logic, a new Service Management System (SMS) to administer the database, and links into ILEC service order processes.

Exhibit 5 Presubscribed DA Solution



30. Finally, it is important to note that this proposal can only be successful with cooperative industry participation. Designation of a subscriber's preferred DA provider is best captured at the front end of the service order process performed by the serving LEC. This information must be communicated from the LEC to the operator of the SCP database for continuous updating. Additionally, this proposal assumes that the local switches are equipped with AIN 0.1 that can be enabled and set-up with associated switch translations to suspend call processing and look externally to the SCP for routing instructions.

411 Trigger

31. Using the 411 trigger example, if a subscriber presubscribes to a DA provider, when the subscriber dials 411, the SSP at the subscriber's local switch recognizes the 411 trigger, suspends the call, and launches a query to an SCP. The SCP then will perform a data look-up to find a key piece of information that determines the routing of the call related to the caller's telephone number and the number he dialed which, in this case, is always 411.

32. Using the routing information obtained from the SCP, the SSP routes the call via a direct trunk group or via an Access Tandem to the Operator switch supporting the designated DA Operator Center.

33. Use of the 411 trigger supersedes the current translation and routing that takes place when a subscriber dials 411. This means that there will be no exception or default routing. Rather, an SSP query and SCP response will take place for all 411 calls, even if the subscriber selects the ILEC as his DA provider. This approach is recommended because:

- It simplifies the translation process. All 411 calls can be handled in the same manner without any requirement to change any call processing function at the switch.
- All the customer records are maintained in a single database.
- Additional equipment will be deployed to handle the incremental traffic load, an estimated 2%, to the existing SS7 network at the local level. (See our DA traffic calculation in Appendix II.)

34. The ILEC's existing DA trunks will remain operational even as some traffic is offloaded to competitive DA providers. At the same time, ILECs must establish new trunks to route 411 traffic to the competitive DA providers. Nonetheless, the ILECs can actually benefit two ways:

- They gain DA trunk capacity for future growth as they compete for DA business.
- They realize new revenues by charging competitive DA providers for trunks.
- They can begin offering themselves as a "competitive DA provider" outside of

their normal serving areas.

Detailed Call Flow

35. This proposal is predicated upon the LECs having upgraded their local switches with AIN 0.1 software and interconnected them to the national SS7 network. As already noted, however, the vast majority of local switches have been upgraded to this standard. The caller's local switch utilizes the specific AIN 0.1 feature that supports the N11 trigger detection point for 411. When 411 is detected as the digits dialed, the 411 trigger detection point (TDP) capability causes a suspension of the call processing, and the SSP launches an SS7 Transactional Capabilities Application Part (TCAP) message to its Regional Signal Transfer Point (RSTP). The RSTP then forwards the SS7 query to one of the new STPs that concentrate and control access to the SCPs equipped with the Subscriber/DA Provider database. The SCPs receive and break apart the incoming SS7 query. Utilizing the caller's Automatic Number Identification (ANI), the call processing logic running within the SCP accesses the database to correlate that ANI with the caller's presubscribed DA provider. The call processing script then points to a second table that correlates the DA provider with the NPA-NXX of the caller's ANI to identify the proper dialing code that must be returned to the originating local switch for call routing. These codes are then inserted as the "dialed digits" in the TCAP response message (replacing the original 411), and returned to the originating switch. The originating local switch then utilizes these "dialed digits" in the SS7 response message to re-initiate call processing, and to route the call through the public network to the designated DA operator switch/call center that services the call.

Areas of Impact

36. This proposal affects a number of related areas within the telecom network. The following paragraphs describe the areas affected.

DA Traffic/SS7 Load Estimates

37. The proposed AIN solution will impose an incremental load on the existing SS7 network.

To calculate the incremental traffic load, we use the following assumptions:

- An industry average of five Directory Assistance calls/month/subscriber,
- 20 average busy days (ABD)/month,
- A 10% average busy hour (ABH)/ABD ratio,
- A 40 second call holding time for DA calls, and
- 85 octets/transaction.[10]

This means that a typical 30,000 line local switch would carry about 750 busy-hour calls, or in telecommunications traffic engineering terms, roughly 300 hundred call-seconds (CCS) load for DA traffic. Assuming two SS7 transactions per call (query + response), this DA traffic generates .416 transactions per second over the SS7 network at the local switch level. When expressed in data communications terms, this figure becomes 35.4 octets/second. As shown in Appendix II, the estimated total SS7 load on a local switch is approximately 1,944 octets/second. So presubscribed 411 adds about 2% incremental load at the local switch level.

End Office/Local Switch Implementation

38. Local switches must be equipped with AIN 0.1 software with the N11 trigger detection point (TDP) capability. As we have stated, AIN 0.1 is already very widely deployed. The N11 TDP capability then must be activated on a local switch basis to recognize 411 as a specific set of dialed digits on which it must act with an SS7 query

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[10] An octet is defined as an 8-bit byte, a unit of data communications. A byte is to a bit what a word is to a character.

and response. Specific call handling of 411 calls would be determined in the office translations returned from the SCP. While there would be no impact on the amount of DA traffic handled by the switch, there will be a nominal increase, about a 2% increase as we have shown, in the SS7 traffic handled on the CCS links from the local switch to the RSTP.

39. Each LEC must activate the Dialed Number Trigger (DNT) for 411 in each SSP. This feature is built into AIN 0.1. This activation is a simple provisioning command for all switches. This command is generated from the telco network control center on a high-level operation support system (OSS) such as Lucent's ConnectVu or equivalent system.

Local/Access Trunking

40. While it is assumed there would be no initial change in the overall DA calling load, there likely will be a shift in the DA traffic load among various trunk groups, depending on subscriber presubscriptions with various DA providers. The ILEC must provision new trunks between the local switches and the access tandem so that callers can connect to their selected DA providers. It should be noted that the ILECs normally will charge these new DA providers for trunking services.

SS7 Network/RSTP

41. There will be an added load onto the SS7 network to support this service. As shown from the previous calculation, however, DA traffic adds only 2% incremental load to the SS7 network at the local level. It is important to note that these incremental loads will aggregate as SS7 transactions are passed up through the network hierarchy to the Regional STPs (RSTPs). Nonetheless, we believe that the total SS7 load will scale proportionally so that DA traffic remains a relatively small contributor to the total.

While we have not attempted to calculate the total network SS7 load as we did at the local level, it should be noted that other components contribute to the load at the network level that are not accounted for at the local level. These components comprise operator-based services that use the following databases: Line Information Database (LIDB) that is used to verify calling card personal identification numbers (PIN) and the caller's presubscribed long distance carrier; billing number screening (BNS) that is used to validate collect calls; and, originating line number screening (OLNS) that is used to validate third-party billing. When the contribution to the SS7 load is added into the total network tally, then we conclude that DA contributes 2% or less to the total across the network.

42. Despite the relatively small incremental signaling traffic load that would be generated by Telegate's solution, we believe that the presubscribed DA solution warrants the establishment of a separate set of STP/SCP pairs. Within the SS7 network, the STPs act as traffic concentrators to deliver messages to the SCPs. STPs are engineered to handle 40% of the SS7 traffic load at the point in the network that they are deployed. STPs are always deployed in pairs. This dual operation is important; if an STP fails, its partner can carry the full load with spare capacity to handle unexpected peaks. SCPs are deployed in conjunction with STPs and function most effectively when they are linked directly to an STP. From a traffic point of view, it may be possible for existing STPs to handle the incremental 2% DA traffic load. From a database perspective, however, we think that our solution warrants a separate database to accommodate the complete set of nationwide telephone listings with presubscribed DA providers, which must be updated daily to reflect presubscription changes. It is possible that a new SCP could be collocated with an existing STP. We recommend, however, that a new STP/SCP combination be established and dedicated to presubscribed DA service.

43. We note here that the call-handling capacity of the SCP is restricted by two factors: the size the database that it must handle; and, its input/output or its transactional processing capability. Based on a projected DA calling load of 1 billion calls per month,[11] we calculate that seven new STP/SCP pairs will be required to interface the RSTPs of the major ILEC and SS7 network providers. This calculation is based on the following assumptions:

- One billion DA calls per month,
- 20 ABD per month,
- A 10% ABH/ABD ratio,
- Two SS7 transactions per DA call.

With these factors, we compute the traffic volume to be 5 million ABH calls, or 2,800 transactions per second. SCPs currently available from Lucent, Nortel, Alcatel/DSC and Tekelec are engineered to handle about 400 transactions per second under normal load conditions. Thus, seven new SCP pairs are needed to handle the projected DA traffic volume. Each STP pair would be designated to serve a geographic area of approximately the same load. New SS7 links will be required to all existing RSTPs in the designated coverage area, and likely between the new STP pairs themselves for redundancy and reliability.

STP/SCP Hardware Deployment

44. Based on the need for seven new STP pairs to support the projected level of DA calling, the SCPs will also be deployed on a distributed basis matching the architecture of the STPs. SCPs will be dedicated to DA traffic with a new SCP at each new STP. From a hardware perspective the SCP is a powerful computer and database that is installed at each new STP. So the DA solution comprises STP/SCP

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[11] Celentano, John M., *Nationwide Directory Assistance: A Sound Choice in the Competitive Cacophony*, X-Change magazine, December 15, 1998, pg. 30.

pairs distributed in seven geographic locations around the network. Industry level pricing from STP vendors such as Lucent and Tekelec indicate that initial deployments of STP/SCP pairs and associated software is about $3 million per site. So, the total capital expenditure associated with the seven STP/SCP pairs required to implement the presubscribed 411 solution is estimated at $21 million.

SCP Application Development

45. A software application must be developed for the SCPs. This application contains the call processing logic that performs the following routine: recognizes the incoming SSP request as being triggered by a caller dialing 411; initiates a database look up to correlate the caller's number with a presubscribed DA provider's telephone number or carrier code; and, returns that routing information to the SSP for completing the call. This application will be developed using the SCE. Once the call processing logic is developed and tested, it will be downloaded to the SCPs from the SMS. Discussions with independent software developers indicate that this application could be developed for about $200,000. This estimate assumes that the developer already has invested in the required computers and test equipment.

Database Development

46. A DA provider database must be created for the SCPs in each serving territory. The database actually is structured in two parts. A primary database correlates all the ANIs in the serving area with their presubscribed DA provider code. A second database maintains, for each DA provider, the required dialed digits (along with a Billing indicator or identification number) that must be returned to the originating local switch to allow it to route the 411 call over the public network to that designated DA provider. At a minimum, the database would be replicated in each of the seven new SCPs. This approach allows for easier database administration across the network, and affords a measure of reliability and redundancy in the event that any one

SCP becomes inoperable. Discussions with independent software developers indicate that this database could be developed for about $400,000.

Database Update Operations

47. A key success factor for presubscribed DA services is that SCPs are updated daily. A new operations process must be established to receive from the LECs daily updates and changes on subscribers' DA provider choices. This SCP update process will be driven primarily by the LEC's own service order process (SOP) for new service installations or changes. The database update operation consists of receiving the incoming data, sorting and verifying the entries for each ANI, and downloading the changes to the SCPs on a daily basis. From discussions with independent software developers, we estimate that the cost to establish the computing hardware and software needed for the update operations is about $600,000.

Telco Service Order Process

48. We believe that a new industry process should be established to support our solution. This process involves determining the subscriber's choice of DA provider and forwarding that information to the operations center for daily database updates. The ILECs must determine the cost of establishing such a process. There are some reference points, however. The determination of the subscriber's selected DA provider is not unlike the process used today for determining the subscriber's selected long distance carrier. Similarly, the forwarding of subscriber line information on a daily basis is done today to support local number portability.

Billing

49. Billing for presubscribed DA services will be handled differently than it is handled today. Billing can be accomplished in several ways. The DA provider could contract billing services from the ILEC using its established billing procedures to capture the call data on every DA call. For high end users of DA services, special contractual arrangements could be made on an ANI basis. So while the billing for the occasional user might be done by the ILEC, the big user's ANI could trigger the return of a no-billing indicator to the ILEC thus permitting the DA provider to bill directly.

Cost Summary

50. The following is a summary of estimated capital expenditures and operating costs to establish presubscribed DA services. These estimates are based on discussions with equipment manufacturers and software developers that are involved in provisioning the SS7 networks and related applications.

Capital Expenditures

51. Table 1 shows our estimates of the capital expenditures required to establish the presubscribed DA service. The items include: the procurement of the seven STP/SCP pairs, site preparation costs, the establishment of local area network (LAN) for connecting the control center to each STP/SCP pair, and wide area network (WAN) facilities for connecting the SMS to each SCP and for linking the STP/SCP pairs together, programming the SCP application in the SCE, procuring the hardware and software needed to create and update the database, and creating the database itself.

Table 1
Projected Capital Expenditures ($ millions)

Item	Investment ($ millions)
STP/SCP Pairs (7 sites)	$21.00
Site preparation (renovate floor space, add power)	0.10
Establish LAN/WAN facilities	0.50
SCP Service Programming	0.20
Initial Database Development	0.40
Database Update Operations (hardware/software)	0.60
Total Capital Expenditures	$22.80

Source: Industry contacts; Skyline Marketing Group estimates

Annual Operating Expenses

52. Table 2 shows our estimates of the annual operating costs required to sustain the service. The items include: rent and utilities, software licenses, WAN line lease charges, STP/SCP vendor maintenance agreements, control center operations and maintenance staff to support the network, and database update operations.

Table 2

Annual Operating Costs ($ millions)

Item	Costs ($ millions)
Space Rental and Utilities	$0.30
Software Usage Fees	0.20
WAN Expenses	2.40
STP/SCP Vendor Service Agreements	1.00
SS7/STP/SCP Operations and Maintenance	2.60
Database Generation Operations	0.60
Total Annual Operating Expenses	$7.10

Source: Industry contacts; Skyline Marketing Group estimates

53. It should be noted that there are a number of costs that are not included above that will have to be borne by the incumbent LEC. These include:

- The cost of equipping the local switches with AIN 0.1 software functionality for those switches not already equipped,
- The cost of activating the 411 trigger, and maintaining local switch translations, and
- The cost of process changes in the ILEC SOP to acquire and transmit the presubscribed DA provider to the SMS/service center.

We assume that these costs should be minimal. As we noted earlier, the vast majority of local switches are already equipped with AIN 0.1. Moreover, when AIN 0.1 deployments began in earnest in 1997 to meet the FCC mandated dates for local number portability operations, both Nortel and Lucent offered their telco customers what they referred to as a "network buyout." This means that the manufacturers offered to upgrade all the installed local switches to AIN 0.1 for a fixed price on a one-time basis. This network buyout included the N11 Trigger feature that the LECs can activate with no additional RTU fees.

54. As noted earlier, there will be an impact on local trunking as the DA load shifts among competing DA providers. This analysis does not include any ILEC costs associated with DA trunking. We did point out, however, that ILECs likely will charge competing DA providers for trunks to connect to their call centers.

55. As we discussed, a shift to an AIN solution will prompt an incremental load on the SS7 network. At the local switch level, the incremental load of about 2% should not have a large impact on the existing infrastructure.

56. Finally, the above cost estimates also do not include the capital expenditures required for the establishment of switches and call centers that the competitive DA providers must make to handle and service 411 calls from their customers.

57. Assuming the ILECs are prepared to proceed, we believe this AIN solution for presubscribed 411 can be implemented in approximately a 6 to 9 month timeframe.

Appendix I

John M. Celentano

Mr. Celentano is President of Skyline Marketing Group. He has over 25 years experience in the telecommunications industry. His background is a unique blend of telephone operating company and equipment manufacturing environments in a variety of engineering, marketing, sales and management positions.

Beginning in 1971, he has worked in systems engineering and management at Bell Canada, in product marketing at Northern Telecom and in strategy consulting at Northern Business Information/Gartner Group. In 1980, he founded Skyline Marketing Group, an Owings Mills, MD-based telecom market consultancy that focuses on public network infrastructure research.

Mr. Celentano's advice on marketing is sought regularly by the leading telecom equipment manufacturers and service providers worldwide. Over the years, his contribution has resulted in over $1 billion in incremental revenues for his clients. He also advises venture capital firms and investment banks on investments in telecom and IT companies.

Mr. Celentano holds a B. Eng. degree in electrical engineering from McMaster University, has studied marketing at the University of California, Santa Barbara and is a graduate of the Bell System Center for Technical Education.

Appendix II

Computation of Typical Local Central Office SS7 Loads

Assumptions:

- A local central office switch equipped with 30,000 lines and 3000 trunks.
- Each line averages five (5) directory assistance (DA) calls per month.
- SS7 signaling requires two (2) transactions per call (query and response). This equals 85 octets, a volume that is similar to what is required for TollFree calls.
- Outgoing (OG) calling comprises 85% IntraLATA calls, and 15% InterLATA calls; IntraOffice (IAO) calling amounts to 50% of Originating Calls.
- TollFree (800/888/877) calling accounts for 25% of InterLATA calls.
- At 15 average busy hour (ABH) calls per trunk (c/t), the Total peak calling volume for all Incoming and Outgoing calls on the switch is: 3000 trunks times 15 ABHc/t equals 45,000 ABHcalls. (Here we assume that: Incoming = 20,000 ABHcalls, Outgoing = 25,000 ABHcalls, so Terminating[12] traffic = Incoming plus IntraOffice = 20,000 + 25,000 = 45,000 ABHcalls).
- Traffic factors include: 20 average busy days (ABD) per month; a 10% average busy hour (ABH) to average busy day (ABD) ratio; an average DA call holding time of 40 seconds.
- Caller ID with Name service achieves 30% penetration of access lines.

Local Switch Load Computation by SS7 Service Type:

The following services are established on the majority of local central offices and generate a respective load on the SS7 network as follows:

- **Call Set Up (ISUP)[13]**: ((3000 trunks * 15 ABHcalls/trunk)/3600 seconds/hour) * 75 Octets/transaction = **937.5 octets/second**

- **Local Number Portability (TCAP/LNP)[14]**: ((25,000 outgoing-ABHcalls * .85 IntraLATA)/3600) * 116 Octets/call = **684.7 octets/second**

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[12] Terminating traffic accounts for all the traffic from outside the switch and within the switch, effectively viewed as "all the traffic that is coming to me." Terminating traffic tally is important for Caller ID with Name (CNAM) display associated with any call "to me."

[13] ISUP is Integrated Services Digital Network User Part and defines the procedures and protocols for setting up, coordinating, and taking down trunk calls that use the SS7 network for signaling.

[14] TCAP is Transactional Capabilities Application Part and defines the procedures and protocols for accessing network databases.

- **Toll Free Calling (TCAP/TollFree)**: (25,000 outgoing ABHcalls *.15 InterLATA) = 3750 InterLATA ABHcalls. If TollFree= 25% of InterLATA, then 3750 InterLATA ABHcalls * .25 = 937.5 ABHcalls. The SS7 load is (937.5 ABHcalls/3600) * 85 Octets/call = **22.1 octets/second**

- **Caller ID with Name Delivery (TCAP/CNAM)**: 45,000 Terminating-ABHcalls * 30% CNAM service penetration = 13,500 CNAMcalls in ABH. Then the SS7 load is (13,500 ABHcalls/3600) * 80 Octets/call = **300 octets/second**

Thus the total SS7 load on a typical 30,000 line local central office switch is **1944 octets/second.**

<u>Computing Incremental SS7 Load for 411PIC:</u>

- For 411 Calls, the computation is (5 DA calls/month)/(20 ABD/month)*(0.1 ABD/ABH) = .025 ABH DA calls/line

- For a 30,000 line office, the computation is (30,000 lines* .025 ABH DAcalls/line) = 750 ABH DA calls, or 750 ABH calls * .4 CCS[15]/call = 300 ABH DA CCS.

- Thus the SS7 Load is (750 ABH DAcalls * 2 transactions/call)/3600 = .416 transactions/second. In turn, .416 transactions/second * 85 Octets/transaction = **35.4 octets/second**

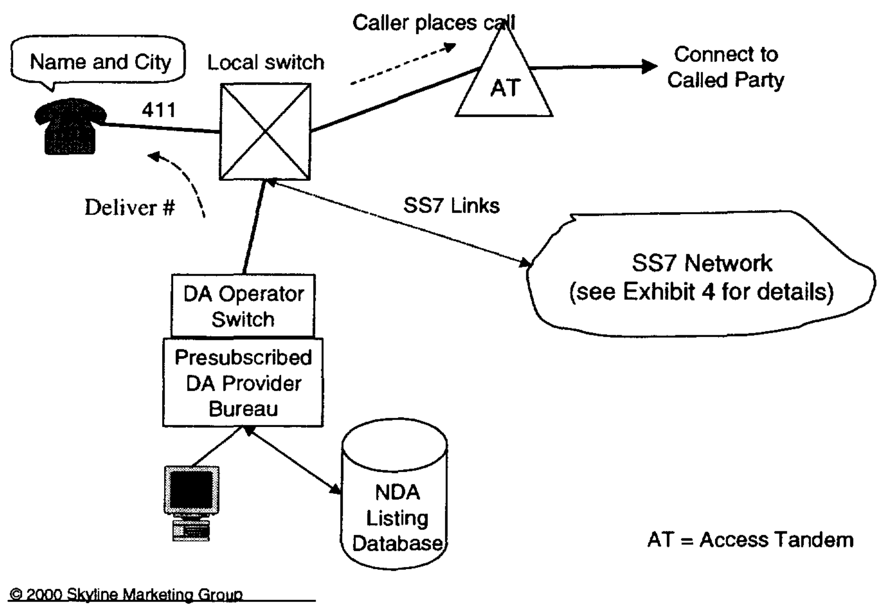
<u>Conclusion:</u>

Presubscribed 411 adds an incremental load of about 2% (35.4/1944) to the SS7 network at the local switch level. As these loads aggregate up the network hierarchy to the Regional STP level, there will be a cumulative effect across the network for all types of calls. However, the accumulation is proportional, and the incremental load for DA calls does not exceed the 2% level.

[15] CCS is Centi Call Seconds or one hundred call seconds, or one hundred seconds of telephone conversation. One hour of telephone conversation is equal to 36 CCS (60 X 60 = 3600 seconds/hours divided by 100 call seconds = 36). CCS are used to determine the optimal call carrying capacity of networks.

Appendix III

Exhibit 5 Presubscribed DA Solution



Elements

CCSN (Common Channel Signaling Network): an "out-of-band" signaling network that utilizes **SS7** (signaling system number 7) protocol.
SSP (Signal Switching Point): local and/or access tandem switches that have been equipped with AIN capabilities.
STP (Signal Transfer Point): a packet data switch that routes SS7 messages between SSPs and the appropriate SCPs. Due to growth of the SS7 network and capacity limitations of the STP, they are often split by far-end destination into local STPs and Regional STPs.
SCP (Service Control Point): a computer that holds a real-time database and service logic. Due to transaction limitations of the computer, SCPs are often segregated by service type and/or geography.
CCS (Common Channel Signaling) **Links**: 56 Kbps or 1.544 Mbps data links that connect various SSP and SCP nodes to STPs (and STPs to other STPs) within the SS7 network.
SMS (Service Management System): a centralized "behind the scenes" database management system for modifying the SCP databases and monitoring SCP performance.
SCE (Service Creation Environment): a computer application used to create and customize services for subscribers.

How It Works

- Service logic for call processing is maintained in databases (SCPs) that are external to the central office (CO) switches.
- A caller dialing a number (referred to as "digits dialed") causes the SSP to suspend the call processing and to "trigger" a "query" over the SS7 links via the STP to the SCP for relevant routing and processing instructions.
- SCP looks up relevant data based on the originating telephone number and the digits dialed, and provides a "response" via the STP to the SSP with instructions on how to route the call, or to direct the caller to take further action before resuming the call processing.
- The "query and response" takes place in less than 1/2 a second, and is virtually transparent to callers.

Benefits to Carriers

- Introduce new services rapidly
- Test market new service concepts before deploying
- Provide service customization
- Establish vendor independence
- Create open interfaces to allow third parties to develop new services on the network

AIN Service Type Offerings

- 800/888/877 Database
- Local Number Portability (LNP)
- Line Information Database (LIDB)
- Custom Local Area Signaling Services (CLASS)
- Follow-Me Service (500)
- Pre-paid Calling Cards
- Single Number Service

I hereby declare under the penalties of perjury that the foregoing is true and correct and that this declaration is executed on March 10, 2000 at Washington, D.C.

John M. Celentano